ROLLER MASSAGE: A COMMENTARY ON CLINICAL STANDARDS AND SURVEY OF PHYSICAL THERAPY PROFESSIONALS- PART 1

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ABSTRACT

Roller massage (RM) has become a popular intervention used by rehabilitation professionals and active individuals. The emerging popularity has resulted in the production of various types of rollers and a growing body of research on the therapeutic effects and science behind RM. Despite the growing popularity and research, there is no consensus on clinical standards such as a describing the intervention, indications, precautions, contraindications, and assessment. There have been no specific peer reviewed publications that have discussed such standards. This leaves a gap in the knowledge regarding how clinicians are integrating the RM research into their clinical practice. The purpose of this clinical commentary is to discuss proposed clinical standards for RM. Part I will discuss the proposed clinical standards and Part II will report the results of a 20-question survey sent to physical therapy (PT) professional members of the Orthopedic and Sports Physical Therapy Sections of the American Physical Therapy Association.

Key Words: foam roller, massage, muscle soreness, myofascial, release, perceived pain, recovery

Level of Evidence: 5

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INTRODUCTION

Roller massage (RM) often also referred to as self-myofascial release (SMR) has become a popular intervention for rehabilitation professionals and active individuals. The growing popularity has stimulated a surge in product development which has produced rollers of varying density, shape, and texture. These devices can be seen in many clinical, fitness, and retail settings. An annual survey by the American College of Sports Medicine reported that RM has been one of the top 20 fitness trends the past two years (2016, 2017).^{1,2} The RM research has also grown throughout the past 10 years with researchers examining the therapeutic effects and basic science behind the intervention.^{3,4}

Despite the growth in products and research, there seems to be a lack of discussion regarding the therapeutic benefits of RM and clinical standards such as describing the intervention, indications, precautions, contraindications, and assessment. A recent search of peer reviewed literature (May 2018) from electronic databases: PubMed, PEDro, Science Direct, and EBSCOhost revealed no specific manuscripts discussing these topics. Other myofascial interventions such as therapeutic massage have published utilization and safety guidelines.⁵⁻⁹ For example, the traditional East Asian instrument assisted massage Gua sha¹⁰ has a body of literature discussing the intervention including treatment protocols,¹¹ side effects,¹²⁻¹⁴ and safety standards.¹¹ Unfortunately, RM lacks such clearly stated guidelines which creates a challenge for rehabilitation professionals who prescribe RM as an intervention and need to advise clients on proper technique and safe use of the device.

There is a need to develop best practice standards through a universal consensus on describing the intervention, indications, precautions, contraindications, and assessment of RM. The purpose of this commentary is to discuss proposed clinical standards for RM. The authors would like to encourage other rehabilitation professionals and researchers to contribute their expertise to the development of such guidelines. Due to the lack of standards, this commentary will synthesize and reference the best existing evidence from other manual and myofascial therapies as they relate to this discussion. Part 1 of this commentary series will be divided into four

content areas: description, indications, precautions & contraindications, and assessment.

DESCRIPTION

For the past 10 years, the intervention has often been referred to as SMR^{3,4,15-31} in the literature which may not clearly represent the intervention. The term SMR may be challenging to accept given the growing body of knowledge that alludes to more comprehensive responses from the body.^{3,4,32} A representative description of SMR is warranted to clearly communicate the intervention to clients and fellow professionals. The description of SMR should be considered a “work in progress” and evolve over time as the knowledge of the intervention grows.

To classify rolling as an “SMR” intervention may not represent what is physiologically occurring during or after the intervention. This presents a challenge since the term “release” alludes to a “setting free”³³ of the myofascial tissues which has long been used with manual myofascial release which is a skilled intervention applied with the rehabilitation professional's hands.^{34,35} RM consists of the client simply rolling on a device or a rehabilitation professional or individual using a device to providing direct tissue massage versus the skilled practice of manual myofascial release which includes both direct and indirect techniques.³⁶

Furthermore, the term “release” may be contrary to the current body of knowledge that suggests that the direct roller pressure may produce a mechanical and global neurophysiological responses that influence tissue relaxation and pain in the local and surrounding tissues through afferent central nervous system (CNS) pathways.³⁷⁻³⁹ These responses may be triggered by low, moderate, or high roller pressure lending evidence to the sensitivity of the myofascia to external forces.³⁹ For the *mechanical effect*, the direct roller pressure may change the viscoelastic properties of the local myofascia by mechanisms such as thixotropy (reduced viscosity), reducing myofascial restriction, fluid changes, and cellular responses.^{40,41} Researchers have also found that rolling reduces local arterial stiffness,²⁸ increases arterial tissue perfusion,³² and improves vascular endothelial function²⁸ which are all related to local physiological changes. For the *neurophysiological effect*, the direct

roller pressure may influence tissue relaxation and pain in the local and surrounding tissues. For tissue relaxation, the roller pressure may induce a greater myofascial relaxation or “stretch tolerance” through CNS afferent input from the Golgi tendon reflex and mechanoreceptors.^{37,40-45} For pain, researchers have postulated that roller pressure may modulate pain through stimulation of cutaneous receptors (e.g. C-tactile fibers),^{37,45,46} mechanoreceptors,³⁸ afferent central nociceptive pathways (gate theory of pain),^{37,42} and descending anti-nociceptive pathways (diffuse noxious inhibitory control).^{37,47} Researchers have found that RM decreases evoked pain⁴² and reduces spinal-level excitability³⁸ which provides evidence for these theories. Based upon this, the term “release” may not represent the current theories that allude to a complex mechanical and neurophysiological response that may occur from this intervention.

Perhaps, SMR needs to have better terminology to define what is currently known about this intervention. One suggestion is to change the terms “self-myofascial release or SMR” to “roller massage or RM” which provides a more general classification and is characteristic of the many types of rollers available to consumers. This may have clinical implications when helping clients to understand the differences as well as for insurance payers to correctly categorize the intervention for reimbursement purposes. For example, rehabilitation professionals may explain to clients that self-administered RM is a therapeutic activity and manual myofascial release is a skilled manual therapy and bill the insurance accordingly. Several researchers have begun to implement nomenclature changes in their peer reviewed publications by using the term “roller massage”,^{37,42,47-50} “self-massage”,^{44,51} or directly naming a device such as a “foam roller”.^{16,32,37,40,52-62} The diversity of rollers and what is currently known about the intervention should be represented in a general term such as RM since the prior term SMR could be misleading to clients.

Besides developing a more representative term, a working description or explanation is warranted to clearly communicate the intervention. In contrast to RM, therapeutic massage and manual myofascial release have more specific descriptions that have

been published. For example, therapeutic massage has been described as “the systematic and scientifically based manipulation of the soft-tissues of the body by a trained professional.”⁶³ (p 473) Manual myofascial release has been described as a “direct-indirect technique involving balancing the structure in 3 planes of motion and making positional corrections that are thought to lead to tissue relaxation”⁶⁴ (p 492) or “a specialized massage technique employed to treat a variety of chronic disorders in which the muscle tissue is stretched and manipulated to relieve tension in the fascia, the thin tissue covering the muscle fibers.”⁶⁵ (p 821) The current evidence on therapeutic massage and manual myofascial release suggests they both produce physiological⁶⁶⁻⁶⁸ and therapeutic benefits^{34,35,69,70} which are represented in their descriptions.

A proposed description for RM may include the following: “roller massage is a type of self or assisted massage that uses a device to manipulate the skin, myofascia, muscles, and tendons by direct compression”. A working description such as this may provide a clear understanding of the intervention and should evolve as the knowledge of RM grows over time (Table 1). Rehabilitation professionals are encouraged to build upon their own knowledge and help better define and describe RM to their clients and fellow clinicians.

INDICATIONS

Currently, there is no consensus on the optimal RM intervention including: type of roller, density, technique, treatment parameters, applied pressure, and cadence.^{3,4} Despite the lack of universal agreement, the existing literature does support the use of RM as a short-term intervention strategy for several conditions (Table 1).^{3,4}

Warm-up. The research supports the use of RM as a pre-exercise warm-up since it has been shown to produce no negative effects on performance.^{3,4,19,62} Researchers have also found that rolling at 10 minute intervals following a warm-up preserved the range of motion (ROM) increases for 30 minutes after the warm-up to a greater degree than no additional rolling with no negative effects on performance.⁷¹ However, researchers have also found that continued rolling between bouts of exercise may decrease muscle performance which should be considered

Table 1. Suggested Roller Massage Guidelines.

Description	"Roller massage is a type of self or assisted massage that uses a device to manipulate the skin, myofascia, muscles, and tendons by direct compression."
Indications	Warm-up, post-exercise recovery, and to increase joint ROM. RM may also have therapeutic benefits for individuals with fibromyalgia and myofascial pain syndrome.
Assessment	<i>Patient reported outcomes:</i> NPRS or VAS <i>Objective measures:</i> ROM, pressure pain threshold, vertical and broad jump, agility tests, movement-based tests, sprints, maximum voluntary contraction, and isokinetic muscle strength.
Precautions	Hypertension, osteopenia, pregnancy, diabetes, varicose veins, bony prominences or regions, abnormal sensations (e.g. numbness), sensitivity to pressure, recent injury or surgery, inability to position body or perform RM, young children, older individuals, scoliosis or spinal deformity, and medications that may alter a clients sensation.
Contraindications	See Table 2
NPRS: numeric pain rating scale; VAS: visual analog scale; ROM: range of motion; RM: roller massage	

when prescribing RM as a warm-up or intersession activity.⁵⁹ Thus, using RM as part of a warm-up may be a viable option for some individuals. Further investigations are needed to validate these findings.

Post-exercise recovery. The current research does support the use of RM for post-exercise recovery. Several researchers have found that post-exercise RM may reduce decrements in muscle performance,^{4,25,30,53,72} increase posttreatment pressure pain thresholds (PPT),^{16,37,53-56,72} and reduce the effects of delayed onset muscle soreness (DOMS) in healthy individuals.^{3,4,30,73,74} Several researchers have documented positive post-exercise effects of RM for different sports,^{73,75-77} occupations,⁷⁸ and fibromyalgia.¹⁵

Range of motion. The research does suggest that RM may increase joint ROM. Several researchers have demonstrated short-term post-intervention increases in joint ROM at the shoulder,^{19,23} lumbo-pelvis,^{20,47} hip,^{44,52,58,60,79-81} knee,^{55-57,60,62} and ankle.^{31,40}

Therapeutic intervention. There is some evidence that suggests RM may have a positive impact on pain, joint ROM, and quality of life for individuals with fibromyalgia¹⁵ and myofascial pain syndrome.²⁴ For sports and orthopedics, RM may have some benefits due to the possible neurophysiological effects (e.g. tissue relaxation and pain modulation) that occur to the local and surrounding tissues.^{16,20,37,40,51,53,59} Researchers have shown that RM to the agonist tissue may effect the muscle activity and PPT of the

ipsilateral antagonist through reciprocal inhibition and the contralateral agonist through a crossover effect.^{16,40,41,82} This may have clinical implications in the presence of injury since rolling on the target or agonist tissues could create a desired neurophysiological effect to the injured antagonist or contralateral muscles. Further research is needed to confirm the therapeutic effects of this intervention. RM alone may not be sufficient enough to prevent or treat an injury.

When comparing the use of RM among rehabilitation professionals to what is found in the research, several similarities can be noted. A recent survey (June to August 2017) of 685 physical therapist Orthopedic and Sports Section members of the American Physical Therapy Association revealed the majority of professionals prescribe RM as an injury treatment (562/685, 82%) followed by a pre-exercise warm-up and post-exercise treatment (378/685, 55%), injury prevention (279/685, 41%), and for performance enhancement (215/685, 31%).⁸³ It appears that rehabilitation professionals are using RM in similar ways that are found in the research. Part II of this series presents the complete survey results.

PRECAUTIONS AND CONTRAINDICATIONS

To date, no clear evidence based safety guidelines have been reported for RM. The precautions and contraindications presented in this section reflect medical conditions that may be unsafe for a client

attempting RM. The best available guidelines may be from related myofascial therapies. This section will synthesize evidence from the therapeutic massage literature which has existing best practice and safety guidelines.^{6,8,11,35,36,84,85} Prior to treatment, the professional is encouraged to conduct a thorough medical screening to determine if RM is safe for the client.

Before rehabilitation professionals prescribe RM to clients, they should consider potential precautions and contraindications and how the intervention is being administered. Three common ways of RM can be considered: self RM with bodyweight, self RM using the upper extremities, and assisted RM. *Self RM using bodyweight*, the client may lay or position a bodypart on a roller and apply pressure with their bodyweight and offset the weight with their hands and feet as needed.²⁸ This type of RM might be an issue if the client cannot perform the movement due to a musculoskeletal impairment or other medical issue. *Self RM with the upper extremity*, the client may use a hand held RM device such as RM stick to massage a body region.⁴⁷ This technique may require the client to have adequate upper extremity ROM, muscle strength, and endurance to perform the massage over

a specific body region or for a certain amount of time. *Assisted RM* involves help from another person, such as a rehabilitation professional, that may use a hand held RM device to administer the massage. This technique requires effective communication between the professional and the client in order to grade the pressure, adjust the technique, and monitor the client's perceived discomfort during the intervention.

These common RM techniques are not unique as other techniques may exist and may need to be individualized for each client. Regardless of technique, RM may require specific precautions or contraindications due to the mechanical pressure caused by the roller.^{42,49} Suggested precautions may include but are not limited to: *hypertension, osteopenia, pregnancy, diabetes, varicose veins, bony prominences or regions, abnormal sensations (e.g. numbness), sensitivity to pressure, recent injury or surgery, inability to position body or perform RM, young children, older individuals, scoliosis or spinal deformity, and medications that may alter a client's sensation* (Table 1).^{8,85} Suggested contraindications are also presented in Table 2. It is important to note that some conditions such as but not limited to pregnancy, diabetes,

Table 2. Roller Massage Contraindications.	
<ul style="list-style-type: none"> • Skin rash, open wounds, blisters, local tissue inflammation, bruises, or tumors • Osteoporosis • Bone fracture or Myositis Ossificans • Acute or severe cardiac, liver, or kidney disease • Neurologic conditions resulting in loss or altered sensation (e.g. Multiple Sclerosis) • Systemic conditions (e.g. Diabetes) • Connective tissue disorders (e.g. Marfan syndrome) • Medications that thin blood or alter sensations • Chronic pain conditions (e.g. Rheumatoid Arthritis) • Pregnancy (consult MD) • Extreme discomfort felt by patient 	<ul style="list-style-type: none"> • Deep Vein Thrombosis or Osteomyelitis • Cancer or malignancy • Hypertension (uncontrolled) • Acute infection (viral or bacterial), fever, or contagious condition • Bleeding disorders (e.g. Hemophilia) • Recent surgery or injury • Peripheral vascular insufficiency or disease • Direct pressure over surgical site or hardware • Direct pressure over face, eyes, arteries, veins (e.g. varicose veins), or nerves • Direct pressure over bony prominences or regions (e.g. lumbar vertebrae) • Severe scoliosis or spinal deformity

varicose veins, and hypertension can be considered either precautionary or contraindicative depending on the client.^{6,8,86} These conditions and others are listed in both categories.

The precautions and contraindications listed in this section are not all inclusive and should be considered a starting point for rehabilitation professionals to build their own list based upon their client population. Unfortunately, no consensus exists on this topic which required synthesis from the therapeutic massage literature which has existing guidelines.^{6,8,11,35,36,84,85} Future studies are needed to validate these suggested precautions and contraindications and to develop best practices and safety guidelines for RM.

ASSESSMENT

Trends in the use of clinical outcomes to measure the effects of RM by rehabilitation professionals has not been discussed in the literature. Researchers have used common patient reported outcomes (PROs) such as the numeric pain rating scale (NPRS) or visual analog scale in their studies.^{3,4} More specifically, the NPRS has been used to measure the post-treatment effects of RM on pain perception^{41,48,72-74,76} and to grade the pressure applied during RM testing by following a predetermined pain level.^{38,39,42,49} Researchers have also used objective measure such as joint ROM, PPT, vertical and broad jump, agility tests, movement based tests, sprints, maximum voluntary contraction, and isokinetic muscle strength (Table 1).^{3,4,30 51}

When comparing RM assessment techniques among professionals to what is used in the research, several similarities can be noted. The recently conducted survey revealed that the majority of professionals reported using PROs (549/685, 80%), and assessments for determination of effects of RM including joint ROM (404/685, 59%), movement-based testing (e.g. FMS™) (291/685, 42%), and pressure pain threshold testing (116/685, 17%).⁸³ Rehabilitation professionals seem to be using similar clinical outcomes as reported in the research. Interestingly, approximately 7% (51/685) of respondents reported not measuring the post-treatment effects of RM. The complete results of the survey will be presented in Part II of this clinical commentary series.

CLINICAL IMPLICATIONS

This discussion attempts to provide a framework for the development of clinical standards for describing RM, indications, precautions, contraindications, and assessment. There are many unknowns regarding RM which warrant such a discussion to help establish best practice standards and to accurately disseminate the information to clients.

For describing RM, a working description that evolves as the knowledge grows may be the best strategy to differentiate RM from other myofascial therapies. *For indications*, RM can be used as a warm-up, post-exercise recovery, and to increase joint ROM. RM may also have therapeutic benefits for individuals with fibromyalgia and myofascial pain syndrome.^{3,4,15,24} The list of indications should constantly evolve as clinicians and researchers further learn the utility of the intervention. *The precautions and contraindications* discussed may seem intuitive to rehabilitation professionals but may not be fully understood by clients. General safety guidelines for RM may help clients use the devices properly and reduce the risk of injury. Due to the lack of existing guidelines, the suggestions were synthesized from other myofascial therapies which may offer the best evidence at this time. As far as *assessment*, proper assessment of outcomes after RM is necessary to determine its effects on clients. It appears that rehabilitation professionals are using similar PROs and objective measures such as joint ROM, movement based testing, and PPT as noted in the research.

CONCLUSIONS

Part I of this clinical commentary series provides a discussion on proposed clinical standards such as a describing RM, indications, precautions, contraindications, and assessment. To date, these standards have not been discussed in the literature. The goal of Part I is to be the starting point to encourage further development of these standards. Rehabilitation professionals and researchers are encouraged to build upon the existing information and help further develop best practice standards for RM.

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